**The Mystery of Yawning**

**打哈欠的奥秘**

According to conventional theory, yawning takes place when people are bored or sleepy and serves the function of increasing alertness by reversing, through deeper breathing, the drop in blood oxygen levels that are caused by the shallow breathing that accompanies lack of sleep or boredom. Unfortunately, the few scientific investigations of yawning have failed to find any connection between how often someone yawns and how much sleep they have had or how tired they are. About the closest any research has come to supporting the tiredness theory is to confirm that adults yawn more often on weekdays than at weekends, and that school children yawn more frequently in their first year at primary school than they do in kindergarten.

根据传统理论，当人们无聊或者困倦时就会打哈欠。伴随睡眠不足或无聊的是浅呼吸，而浅呼吸会降低血液中氧的含量。打哈欠可以通过深呼吸逆转这一点，增加血液中氧的含量从而达到提高警觉性的功能。但遗憾的是，少量关于打哈欠的科学研究并没有找到任何打哈欠频率与个人睡眠时长或者疲劳程度之间的联系。最近所有用于支持疲劳理论的研究是为了确认成人在工作日比在周末打哈欠的频率更高；学生在小学一年级比在幼儿园时打哈欠的频率要高。

Another flaw of the tiredness theory is that yawning does not raise alertness or physiological activity, as the theory would predict. When researchers measured the heart rate, muscle tension and skin conductance of people before, during and after yawning, they did detect some changes in skin conductance following yawning, indicating a slight increase in physiological activity. However, similar changes occurred when the subjects were asked simply to open their mouths or to breathe deeply. Yawning did nothing special to their state of physiological activity. Experiments have also cast serious doubt on the belief that yawning is triggered by a drop in blood oxygen or a rise in blood carbon dioxide. Volunteers were told to think about yawning while they breathed either normal air, pure oxygen, or an air mixture with an above-normal level of carbon dioxide. If the theory was correct, breathing air with extra carbon dioxide should have triggered yawning, while breathing pure oxygen should have suppressed yawning. In fact, neither condition made any difference to the frequency of yawning, which remained constant at about 24 yawns per hour. Another experiment demonstrated that physical exercise, which was sufficiently vigorous to double the rate of breathing, had no effect on the frequency of yawning. Again the implication is that yawning has little or nothing to do with oxygen.

疲劳理论的另一个缺陷是打哈欠并不如该理论所预期的那样提高警觉性或生理活动。研究人员在（志愿者）打哈欠的前、中、后三个阶段均测量了心率、肌肉张力以及皮肤传导性，而他们测得皮肤传导性在打哈欠后的确存在一些变化，这一变化表明生理活动有轻微的增强。但是，在实验者被要求只是张开嘴或深呼吸时，皮肤传导性也发生了相似的变化。打哈欠对于生理活动的状态并无特殊作用。实验结果也对“打哈欠是由血液中氧含量下降或由血液中二氧化碳含量上升所引起的”这一论断产生了严重怀疑。志愿者被告知当他们吸入普通空气、纯氧或者是含有高于正常水平的二氧化碳的空气混合物时要想着打哈欠。如果疲劳理论是正确的，那么当人吸入额外的二氧化碳时，应该能够激发打哈欠；当吸入纯氧时应该能够抑制打哈欠。但实际上，在这两种条件下，打哈欠的频率并无任何差异，均维持在稳定的约24个每小时。另一个实验证明，即使是可以让呼吸频率翻倍的剧烈运动对于打哈欠频率也毫无影响。这再一次说明打哈欠几乎或完全与氧气无关。

A completely different theory holds that yawning assists in the physical development of the lungs early in life, but has no remaining biological function in adults. It has been suggested that yawning and hiccupping might serve to clear out the fetus’s airways. The lungs of a fetus secrete a liquid that mixes with its mother's amniotic fluid. Babies with congenital blockages that prevent this fluid from escaping from their lungs are sometimes born with deformed lungs. It might be that yawning helps to clear out the lungs by periodically lowering the pressure in them. According to this theory, yawning in adults is just a developmental fossil with no biological function. But, while accepting that not everything in life can be explained by Darwinian evolution, there are sound reasons for being skeptical of theories like this one, which avoid the issue of what yawning does for adults. Yawning is distracting, consumes energy and takes time. It is almost certainly doing something significant in adults as well as in fetuses. What could it be?

一个完全不同的理论认为，打哈欠有助于早期肺部的发育，但是对于成年人来说并无任何生理功效。这也暗示了打哈欠和打嗝或许能够清理胎儿的呼吸道。胎儿的肺会分泌一种混合着母亲羊水的液体。当患有先天性肺不张的婴儿的肺部阻止这种液体从肺中流出时，这些婴儿出生时肺部就会变形。打哈欠很可能是通过周期性的降低肺部压力，帮助清除肺部中的这些液体。按照该理论，成年人打哈欠只是一个没有生理功效的发育阶段的化石。但是，当人们已认同达尔文的进化论并不能解释所有现象时，我们有充分的理由去怀疑这一没有解释成年人打哈欠的问题的理论。打哈欠是分散精力的，费时又耗力。但是，几乎可以肯定是，打哈欠不仅对胎儿，对成年人也有重要的作用。那么，究竟是什么作用呢？

The empirical evidence, such as it is, suggests an altogether different function for yawning—namely, that yawning prepares us for a change in activity level. Support for this theory came from a study of yawning behavior in everyday life. Volunteers wore wrist-mounted devices that automatically recorded their physical activity for up to two weeks: the volunteers also recorded their yawns by pressing a button on the device each time they yawned. The data showed that yawning tended to occur about 15 minutes before a period of increased behavioral activity. Yawning bore no relationship to sleep patterns, however. This accords with anecdotal evidence that people often yawn in situations where they are neither tired nor bored, but are preparing for impending mental and physical activity. Such yawning is often referred to as "incongruous" because it seems out of place, at least on the tiredness view: soldiers yawning before combat, musicians yawning before performing, and athletes yawning before competing. Their yawning seems to have nothing to do with sleepiness or boredom—quite the reverse—but it does precede a change in activity level.

经验结果表明，虽然如此，打哈欠确实有着完全不同的功能——换而言之，我们打哈欠是为活动水平的变化而做的准备。一个“对日常生活中打哈欠行为的研究”支撑了这一论断。志愿者在手腕上携带一种装置，这一装置会自动记录他们在两周里的身体活动情况。另外，志愿者也要通过点击装置上的按钮来记录自己每一次打哈欠的情况。数据显示，打哈欠大多在增强性行为活动的15分钟前发生。但同时指出，打哈欠与睡眠状态没有关系。这一论断符合坊间的传闻：人们通常是既不疲惫也不无聊，但要准备接下来的脑力活动和体力活动时才会打哈欠。这样的哈欠通常被认为是“不协调的”，因为至少从疲倦状态下的角度看，这样的哈欠似乎与疲惫无关：比如战士们在开始战斗前会打哈欠；音乐家在表演前会打哈欠；运动员在比赛前会打哈欠。他们的哈欠看上去似乎与困倦、疲乏无关，但是恰恰相反，这一行为的确出现在了活动水平的变化之前。